wherein separation of radiation patterns among either said transmitter antenna elements or said receiver antenna elements is insufficient to establish completely isolated spatial directions for communication; and wherein

at least one of said transmitting and receiving steps comprises processing said signals to increase isolation between spatial directions employed for communication at a common frequency.

2. The method of claim 1 wherein a channel coupling said plurality of transmitter antenna elements and receiver antenna elements at said common frequency is characterized by a spatial channel matrix having a rank greater than one.

3. In a digital communication system, a method for communicating comprising the steps of:

transmitting signals from one or more transmitter antenna elements;

receiving said signals via a plurality of receiver antenna elements;

wherein separation of radiation patterns among either said transmitter antenna elements or said receiver antenna elements is insufficient to establish completely isolated spatial directions for communication; and wherein

at least one of said transmitting and receiving steps comprises processing said signals to increase isolation between subchannels, each subchannel associated with a spatial direction and a bin of a substantially orthogonalizing procedure.

4. The method of claim 3 wherein said substantially orthogonalizing procedure belongs to a group including: an inverse Fast Fourier Transform, a Fast Fourier Transform, a Hilbert transform, a wavelet transform, and processing through a set of bandpass filter/frequency upconverter pairs operating at spaced apart frequencies.

5. In a digital communication system, a method for preparing a sequence of symbols for transmission via a plurality of inputs of a channel:

a) inputting said symbols of said sequence into a plurality of inputs corresponding to a plurality of subchannels of said channel, each subchannel corresponding to an input bin of a transmitter substantially orthogonalizing procedure and a spatial direction;

b) for each input bin, spatially processing symbols inputted to said subchannels corresponding to said input bin, to develop a spatially processed symbol to assign to each combination of channel input and input bin of said transmitter substantially orthogonalizing procedure; and

c) applying, independently for each said channel input, said transmitter substantially orthogonalizing procedure to said spatially processed symbols assigned to each said channel input.

6. The method of claim 5 wherein said b) step has the effect of making spatial directions of said subchannels into a set of orthogonal spatial dimensions.

A1

7.(AMENDED) The method of claim [5] 224 wherein said transmitter substantially orthogonalizing procedure belongs to one of a group consisting of an inverse Fast Fourier Transform, a Fast Fourier Transform, a discrete cosine transform, a Hilbert transform, a wavelet transform, and processing through a plurality of bandpass filter/frequency converter pairs centered at spaced apart frequencies.

8.(AMENDED) The method of claim [5] 224 further comprising the step of, after said c) step, applying a cyclic prefix processing procedure to a result of said substantially orthogonalizing procedure independently for each channel input.

PATENT

9. (AMENDED) The method of claim **[5]** 224 wherein said transmitter substantially orthogonalizing procedure is optimized to reduce interference to unintended receivers.

10. (AMENDED) The method of claim **[5]** 224 wherein said b) step comprises, for each particular input bin, multiplying a **[vector comprising] [symbols]** symbol allocated to the **[subchannels]** subchannel corresponding to said input bin by a beneficial weighting **[matrix]** vector, elements of a result vector of said multiplying step corresponding to different channel inputs of said plurality of channel inputs.

A1

11. (AMENDED) The method of claim 10 wherein said beneficial weighting **[matrix comprises]** vector forms a part of an input singular matrix of a matrix containing values representing characteristics of said channel, said channel coupling said plurality of channel inputs to one or more channel outputs.

12. (AMENDED) The method of claim 10 wherein said beneficial weighting **[matrix]** vector is obtained from a matrix containing values representing characteristics of a channel coupling said plurality of channel inputs to one or more channel outputs.

13. (AMENDED) The method of claim 10 wherein said beneficial weighting **[matrix]** vector is chosen to reduce interference to unintended receivers.

14. (AMENDED) The method of claim 13 wherein said beneficial weighting **[matrix]** vector is chosen based upon characterization of a desired signal subspace.

PATENT

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15. (AMENDED) The method of claim 14 wherein said beneficial weighting **[matrix]** vector is chosen further based upon characterization of an undesired signal subspace.

16. The method of claim 15 wherein characterizations of said desired signal subspace and said undesired signal subspace are averaged over at least one of time and frequency.

17. The method of claim 10 wherein said b) step comprises performing said spatial processing step so as to reduce interference radiated to unintended receivers.

19. The method of claim 10 further comprising the step of prior to said b) step applying a coding procedure to said symbols.

20. The method of claim 19 wherein said coding procedure is applied independently for each of said subchannels.

23. The method of claim 19 wherein said coding procedure is applied integrally across all of said subchannels.

24. The method of claim 19 wherein said coding procedure belongs to a group consisting of: convolutional coding, Reed-Solomon coding, CRC coding, block coding, trellis coding, turbo coding, and interleaving.

25. The method of claim 19 wherein said coding procedure comprises a trellis coding procedure.

26. The method of claim 25 wherein a code design of said trellis coding procedure is based on one of: improved bit error performance in interference channels, a periodic product distance metric, exhaustive code polynomial search for favorable bit error rate polynomial searches, combined weighting of product distance and Euclidean distance, product distance of multiple

Euclidean distances over short code segments or over a multi-dimensional symbol, and sum of product distances over short code segments.

27. The method of claim 25 wherein a code design of said trellis coding procedure is optimized for performance in a fading matrix channel.

28. The method of claim 19 wherein said coding procedure comprises a one-dimensional trellis coding procedure followed by an interleaving procedure with sequential groups of symbols output by said trellis coding having their internal order maintained by said interleaving procedure.

29. The method of claim 19 wherein said coding procedure comprises a multi-dimensional trellis coding procedure followed by an interleaving procedure with groups of one-dimensional symbols output simultaneously by said multi-dimensional trellis coding procedure having their internal order maintained by said interleaving procedure.

30. The method of claim 10 wherein bit loading and power are allocated to each subchannel.

31.(AMENDED) The method of claim [10] 224 further comprising the step of retransmitting symbols by repeating at least one of said a), b), and c) steps upon receipt of a notification that said symbols to be retransmitted have been incorrectly received.

A2

32.(AMENDED) The method of claim [10] 224 wherein said channel comprises a wireless channel and said plurality of channel inputs are associated with a corresponding plurality of transmitter antenna elements.

PATENT

33. The method of claim 32 wherein said plurality of transmitter antenna elements are co-located.

A3

34. (AMENDED) The method of claim 32 wherein said plurality of **[transmitters]** transmitter antenna elements at disparate locations.

35. A method of processing a sequence of symbols received via a plurality of outputs of a channel, said method comprising the steps of:

a) applying a receiver substantially orthogonalizing procedure to said sequence of symbols, said procedure being applied independently for each of said plurality of channel outputs, each output symbol of said receiver substantially orthogonalizing procedure corresponding to a particular output bin and a particular one of said channel outputs; and

b) for each output bin, spatially processing symbols corresponding to said output bin to develop spatially processed symbols assigned to a plurality of spatial directions, each combination of spatial direction and output bin specifying one of a plurality of subchannels.

36. The method of claim 35 wherein said b) step has the effect of making said plurality of spatial directions into a set of orthogonal spatial dimensions.

A4

37. (AMENDED) The method of claim **[35]** 225 wherein said receiver substantially orthogonalizing procedure belongs to one of a group consisting of an inverse Fast Fourier Transform, a Fast Fourier Transform, a discrete cosine transform, a Hilbert transform, a wavelet transform, and processing through a plurality of bandpass filter/frequency converter pairs centered at spaced apart frequencies.

38. (AMENDED) The method of claim **[35]** 225 further comprising the step of, prior to said a) step, applying a cyclic

prefix removal procedure to said sequence of symbols independently for each of said channel outputs.

39. (AMENDED) The method of claim **[35]** 225 wherein said receiver substantially orthogonalizing procedure is optimized to reduce deleterious effects of interference from undesired co-channel transmitters.

40. (AMEMDED) The method of claim **[35]** 225 wherein said b) step comprises, for each particular output bin, multiplying a vector comprising symbols **[of]** received via said output bin and all said channel outputs by a beneficial weighting **[matrix]** vector, **[elements of]** a result **[vector]** symbol of said multiplying step corresponding to **[different spatial directions]** each output bin.

A4

41. (AMENDED) The method of claim 40 wherein said beneficial weighting **[matrix]** vector **[comprises]** forms a part of an output singular vector of a matrix containing values representing characteristics of said channel, said channel coupling one or more channel inputs to said plurality of channel outputs.

42. (AMENDED) The method of claim 40 wherein said beneficial weighting **[matrix]** vector is chosen to minimize deleterious effects of interference from undesired transmitters.

43. (AMENDED) The method of claim 42 wherein said beneficial weighting **[matrix]** vector is chosen based upon characterization of a desired signal subspace.

44. (AMENDED) The method of claim 43 wherein said beneficial weighting **[matrix]** vector is chosen further based upon characterization of an undesired signal subspace.

45. The method of claim 44 wherein said characterizations of said desired signal subspace and said undesired signal subspace are averaged over at least one of time and frequency.

46. (AMENDED) The method of claim 40 wherein said beneficial weighting **[matrix]** vector is obtained from a matrix containing values representing characteristics of said channel, said channel coupling one or more channel inputs and said plurality of channel outputs.

A5

47. (AMENDED) The method of claim 46 wherein said beneficial weighting **[matrix]** vector is obtained by an MMSE procedure.

48. (AMENDED) The method of claim **[35]** 225 further comprising the step of after said b) step applying a decoding procedure to said symbols.

49. The method of claim 48 wherein said decoding procedure is applied independently for each of said plurality of subchannels.

A6

50. (AMENDED) The method of claim 48 wherein said decoding procedure is applied independently for each **[group of subchannels corresponding to an]** output bin of said substantially orthogonalizing procedure.

52. The method of claim 48 wherein said decoding procedure is applied integrally across all of said plurality of subchannels.

53. The method of claim 48 wherein said decoding procedure belongs to a group consisting of: Reed-Solomon decoding, CRC decoding, block decoding, and de-interleaving.

54. The method of claim 48 wherein said decoding procedure comprises a code sequence detection procedure to decode a trellis code, or convolutional code.

55. The method of claim 54 wherein said code sequence detection procedure employs a metric belonging to a group consisting of: Euclidean metric, weighted Euclidean metric, and Hamming metric.

56. The method of claim 48 wherein said decoding procedure reduces deleterious effects of interference from undesired transmitters.

57. (AMENDED) The method of claim **[35]** <u>225</u> further comprising the step of:

sending a retransmission request when received symbols are determined to include errors.

A7

58. (AMENDED) The method of claim **[35]** <u>225</u> wherein said channel comprises a wireless channel and said plurality of channel outputs are coupled to a plurality of corresponding receiver antenna elements.

59. (AMENDED) The method of claim **[35]** <u>225</u> wherein said plurality of receiver antenna elements are co-located.

60. (AMENDED) The method of claim **[35]** <u>225</u> wherein said plurality of receiver antenna elements are at disparate locations.

109. In a digital communication system, a method for communicating over a channel having at least one input and at least one output, and having a plurality of either inputs or outputs, said method comprising the steps of:

dividing said channel into a plurality of subchannels, each subchannel corresponding to a combination of spatial

direction and an input bin of a substantially orthogonalizing procedure; and

communicating symbols over one or more of said plurality of subchannels.

110. In a digital communication system, a method for preparing a sequence of symbols for transmission via a plurality of inputs of a channel, comprising the steps of:

a) inputting said symbols of said sequence into a plurality of input corresponding to a plurality of subchannels of said channel, each subchannel corresponding to an input bin of a transmitter substantially orthogonalizing procedure and a channel input; and

b) applying, independently for each said channel input, said transmitter substantially orthogonalizing procedure to said symbols assigned to each said channel input.

111. A method of processing a sequence of symbols received via a plurality of outputs of a channel, said method comprising the steps of:

a) applying a substantially orthogonalizing procedure to said sequence of symbols, said procedure being applied independently for each of said plurality of channel outputs, each output symbol of said substantially orthogonalizing procedure corresponding to a subchannel identified by a combination of a particular output bin and a particular one of said channel outputs; and

b) processing symbols in said subchannels.

112. In a digital communication system, apparatus for communicating comprising:

a transmitter that transmits signals from one or more transmitter antenna elements;

a receiver that receives said signals from via a plurality of receiver antenna elements;

wherein separation of radiation patterns among either said transmitter antenna elements or said receiver antenna elements is

insufficient to establish completely isolated spatial directions for communication; and wherein

at least one of said transmitter and said receiver comprises a processor that processes said signals to increase isolation between spatial directions employed for communication at a common frequency.

113. The apparatus of claim 112 wherein a channel coupling said plurality of transmitter antenna elements and receiver antenna elements at said common frequency is characterized by a spatial channel matrix having a rank greater than one.

114. In a digital communication system, apparatus for communicating comprising:

a transmitter transmitting signals from one or more transmitter antenna elements;

a receiver receiving said signals via a plurality of receiver antenna elements;

wherein separation of radiation patterns among either said transmitter antenna elements or said receiver antenna elements is insufficient to establish completely isolated spatial directions for communication; and wherein

at least one of said transmitter and said receiver comprises a processor that processes said signals to increase isolation between subchannels, each subchannel associated with a spatial direction and a bin of a substantially orthogonalizing procedure.

115. The apparatus of claim 114 wherein said substantially orthogonalizing procedure belongs to a group including: an inverse Fast Fourier Transform, a Fast Fourier Transform, a Hilbert transform, a wavelet transform, and processing through a set of bandpass filter/frequency upconverter pairs operating at spaced apart frequencies.

PATENT

116. In a digital communication system, apparatus for preparing a sequence of symbols for transmission via a plurality of inputs of a channel:
a plurality of parallel subchannel inputs receiving said symbols, said parallel subchannel inputs corresponding to a plurality of subchannels, each subchannel corresponding to an input bin of a transmitter substantially orthogonalizing procedure and a spatial direction;
a spatial processor that, for each input bin, spatially processor symbols received by said subchannel inputs corresponding to said input bin, to develop a spatially processed symbol to assign to each combination of channel input and input bin of said transmitter substantially orthogonalizing procedure; and
a substantially orthogonal procedure processor system that applies, independently for each said channel input, said transmitter substantially orthogonalizing procedure to said spatially processed symbols assigned to each said channel input.

117. The apparatus of claim 116 wherein said spatial processor has the effect of making spatial directions of said subchannels into a set of orthogonal spatial dimensions.

A8

118.(AMENDED) The apparatus of claim **[116]** <u>226</u> wherein said transmitter substantially orthogonalizing procedure belongs to one of a group consisting of an inverse Fast Fourier Transform, a Fast Fourier Transform, a discrete cosine transform, a Hilbert transform, a wavelet transform, and processing through a plurality of bandpass filter/frequency converter pairs centered at spaced apart frequencies.

119.(AMENDED) The apparatus of claim **[116]** <u>226</u> further comprising: a cyclic prefix processor that applies a cyclic prefix processing procedure to a result of said substantially orthogonalizing procedure independently for each channel input.

120. (AMENDED) The apparatus of claim **[116]** 226 wherein said transmitter substantially orthogonalizing procedure is optimized to reduce interference to unintended receivers.

121. (AMENDED) The apparatus of claim **[116]** 226 wherein said spatial processor comprises, for each particular input bin, a weight multiplier that multiplies a **[vector comprising symbols]** symbol allocated to **[subchannels corresponding to]** said input bin by a beneficial weighting **[matrix]** vector, elements of a result vector of said weight multiplier corresponding to different channel inputs of said plurality of channel inputs.

A8

122. (AMENDED) The apparatus of claim 121 wherein said beneficial weighting **[matrix comprises]** vector forms a part of an input singular matrix of a matrix containing values representing characteristics of said channel, said channel coupling said plurality of channel inputs to one or more channel outputs.

123. (AMENDED) The apparatus of claim 121 wherein said beneficial weighting **[matrix]** vector is obtained from a matrix containing values representing characteristics of a channel coupling said plurality of channel inputs to one or more channel outputs.

124. (AMENDED) The apparatus of claim 121 wherein said beneficial weighting **[matrix]** vector is chosen to reduce interference to unintended receivers.

125. (AMENDED) The apparatus of claim 124 wherein said beneficial weighting **[matrix]** vector is chosen based upon characterization of a desired signal subspace.

126. (AMENDED) The apparatus of claim 125 wherein said beneficial weighting **[matrix]** vector is chosen further based upon characterization of an undesired signal subspace.

PATENT

127. The apparatus of claim 126 wherein characterizations of said desired signal subspace and said undesired signal subspace are averaged over at least one of time and frequency.

128. The apparatus of claim 116 wherein said spatial processor operates so as to reduce interference radiated to unintended receivers.

A9

130. (AMENDED) The apparatus of claim **[116]** <u>226</u> further comprising a coder that applies a coding procedure to said symbols prior to processing by said spatial processor.

131. The apparatus of claim 130 wherein said coding procedure is applied independently for each of said subchannels.

134. The apparatus of claim 130 wherein said coding procedure is applied integrally across all of said subchannels.

135. The apparatus of claim 130 wherein said coding procedure belongs to a group consisting of: convolutional coding, Reed-Solomon coding, CRC coding, block coding, trellis coding, turbo coding, and interleaving.
vector

136. The apparatus of claim 130 wherein said coding procedure comprises a trellis coding procedure.

137. The apparatus of claim 136 wherein a code design of said trellis coding procedure is based on one of: improved bit error performance in interference channels, a periodic product distance metric, exhaustive code polynomial search for favorable bit error rate polynomial searches, combined weighting of product distance and Euclidean distance, product distance of multiple Euclidean distances over short code segments or over a

multi-dimensional symbol, and sum of product distances over short code segments.

138. The apparatus of claim 136 wherein a code design of said trellis coding procedure is optimized for performance in a fading matrix channel.

139. The apparatus of claim 130 wherein said coding procedure comprises a one-dimensional trellis coding procedure followed by an interleaving procedure with sequential groups of symbols output by said trellis coding having their internal order maintained by said interleaving procedure.

140. The apparatus of claim 130 wherein said coding procedure comprises a multi-dimensional trellis coding procedure followed by an interleaving procedure with groups of one-dimensional symbols output simultaneously by said multi-dimensional trellis coding procedure having their internal order maintained by said interleaving procedure.

141. The apparatus of claim 130 wherein bit loading and power are allocated to each subchannel.

A10

142.(AMENDED) The apparatus of claim **[116]** 226 further comprising an ARQ system that retransmits symbols via at least one of said spatial processor, and said substantially orthogonalizing procedure processor upon receipt of a notification that said symbols to be retransmitted have been incorrectly received.

143.(AMENDED) The apparatus of claim **[116]** 226 wherein said channel comprises a wireless channel and said plurality of channel inputs are associated with a corresponding plurality of transmitter antenna elements

144. The apparatus of claim 142 wherein said plurality of transmitter antenna elements are co-located.

A11

145. (AMENDED) The apparatus of claim 144 wherein said plurality of [transmitters] <u>transmitter elements</u> are at disparate locations.

146. Apparatus of processing a sequence of symbols received via a plurality of outputs of a channel, said apparatus comprising:

a substantially orthogonalizing procedure processor system that applies a receiver substantially orthogonalizing procedure to said sequence of symbols, said procedure being applied independently for each of said plurality of channel outputs, each output symbol of said substantially orthogonalizing procedure corresponding to a particular output bin and a particular one of said channel outputs; and

a spatial processor that, for each output bin, spatially processes symbols corresponding to said output bin to develop spatially processed symbols assigned to a plurality of spatial directions, each combination of spatial direction and output bin specifying one of a plurality of subchannels.

147. The apparatus of claim 146 wherein said spatial processor operates to make said plurality of spatial directions into a set of orthogonal spatial dimensions.

A12

148. (AMENDED) The apparatus of claim **[146]** <u>227</u> wherein said receiver substantially orthogonalizing procedure belongs to one of a group consisting of an inverse Fast Fourier Transform, a Fast Fourier Transform, a discrete cosine transform, a Hilbert transform, a wavelet transform, and processing through a plurality of bandpass filter/frequency converter pairs centered at spaced apart frequencies.

149. (AMENDED) The apparatus of claim **[146]** 227 further comprising: a cyclic prefix processor that applies a cyclic prefix removal procedure to said sequence of symbols independently for each of said channel outputs.

150. (AMENDED) The apparatus of claim **[146]** 227 wherein said receiver substantially orthogonalizing procedure is optimized to reduce deleterious effects of interference from undesired co-channel transmitters.

A12

151. (AMENDED) The apparatus of claim **[146]** 227 wherein said spatial processor comprises, for each particular output bin, a weight multiplier that multiplies a vector comprising symbols **[of]** received said output bin by a beneficial weighting **[matrix]** vector, **[elements of]** a result **[vector of said multiplier corresponding to different spatial directions]** symbol for said output bin.

152. (AMENDED) The apparatus of claim 151 wherein said beneficial weighting **[matrix comprises]** vector forms a part of an output singular vector of a matrix containing values representing characteristics of said channel, said channel coupling one or more channel inputs to said plurality of channel outputs.

153. (AMENDED) The apparatus of claim 151 wherein said beneficial weighting **[matrix]** vector is chosen to minimize deleterious effects of interference from undesired transmitters.

154. (AMENDED) The apparatus of claim 151 wherein said beneficial weighting **[matrix]** vector is chosen based upon characterization of a desired signal subspace.

155. (AMENDED) The apparatus of claim 154 wherein said beneficial weighting **[matrix]** vector is chosen further based upon characterization of an undesired signal subspace.

156. The apparatus of claim 155 wherein said characterizations of said desired signal subspace and said undesired signal subspace are averaged over at least one of time and frequency.

157.(AMENDED) The apparatus of claim 151 wherein said beneficial weighting **[matrix]** vector is obtained from a matrix containing values representing characteristics of said channel, said channel coupling one or more channel inputs and said plurality of channel outputs.

158.(AMENDED) The apparatus of claim 157 wherein said beneficial weighting **[matrix]** vector is obtained by an MMSE procedure.

A13

159.(AMENDED) The apparatus of claim **[146]** 227 further comprising: a decoder that applies a decoding procedure to said spatially processed symbols.

160. The apparatus of claim 159 wherein said decoding procedure is applied independently for each of said plurality of subchannels.

163. The apparatus of claim 159 wherein said decoding procedure is applied integrally across all of said plurality of subchannels.

164. The apparatus of claim 159 wherein said decoding procedure belongs to a group consisting of: Reed-Solomon decoding, CRC decoding, block decoding, and de-interleaving.

165. The apparatus of claim 159 wherein said decoding procedure comprises a code sequence detection procedure to decode a trellis code, or convolutional code.

166. The apparatus of claim 165 wherein said code sequence detection procedure employs a metric belonging to a group consisting of: Euclidean metric, weighted Euclidean metric, and Hamming metric.

167. The apparatus of claim 159 wherein said decoding procedure reduces deleterious effects of interference from undesired transmitters.

A14

168.(AMENDED). The apparatus of claim **[146]** <u>227</u> further comprising:

a system that sends a retransmission request when received symbols are determined to include errors.

169. The apparatus of claim 170 wherein said channel comprises a wireless channel and said plurality of channel outputs are coupled to a plurality of corresponding receiver antenna elements.

171. The apparatus of claim 170 wherein said plurality of receiver antenna elements are co-located.

172. The apparatus of claim 170 wherein said plurality of receiver antenna elements are at disparate locations.

221. In a digital communication system, apparatus for communicating over a channel having at least one input and at least one output, and having a plurality of either inputs or outputs, said apparatus comprising:

means for dividing said channel into a plurality of subchannels, each subchannel corresponding to a combination of spatial direction and an input bin of a substantially orthogonalizing procedure; and

means for communicating symbols over one or more of said plurality of subchannels.

222. In a digital communication system, apparatus for preparing a sequence of symbols for transmission via a plurality of inputs of a channel, said apparatus comprising:

a plurality of parallel subchannel inputs that receive said sequence of symbols, said subchannel inputs corresponding to a plurality of subchannels, each subchannel corresponding to an input bin of a transmitter substantially orthogonalizing procedure and a channel input; and

a substantially orthogonalizing procedure processor that applies, independently for each said channel input, said transmitter substantially orthogonalizing procedure to said symbols assigned to each said channel input.

223. Apparatus for processing a sequence of symbols received via a plurality of outputs of a channel, said apparatus comprising the steps of:

a substantially orthogonalizing procedure processor that applies a receiver substantially orthogonalizing procedure to said sequence of symbols, said procedure being applied independently for each of said plurality of channel outputs, each output symbol of said receiver substantially orthogonalizing procedure corresponding to a subchannel identified by a combination of a particular output bin and a particular one of said channel outputs; and

a processor that processes symbols in said subchannels.

Please add new claims 224-227 as follows.

A15

--224. (NEW) In a digital communication system, a method for preparing a sequence of symbols for transmission via a plurality of inputs of a channel:

a) inputting said symbols of said sequence into a plurality of inputs corresponding to a plurality of subchannels of said channel, each subchannel corresponding to an input bin of a transmitter substantially orthogonalizing procedure and a spatial direction associated with said input bin;

b) for each input bin, spatially processing symbols inputted to said subchannel corresponding to said input bin, to develop a spatially processed symbol to assign to each combination of channel input and input bin of said transmitter substantially orthogonalizing procedure; and

c) applying, independently for each said channel input, said transmitter substantially orthogonalizing procedure to said spatially processed symbols assigned to each said channel input.

225. (NEW) A method of processing a sequence of symbols received via a plurality of outputs of a channel, said method comprising the steps of:

a) applying a receiver substantially orthogonalizing procedure to said sequence of symbols, said procedure being applied independently for each of said plurality of channel outputs, each output symbol of said receiver substantially orthogonalizing procedure corresponding to a particular output bin and a particular one of said channel outputs; and

A15

b) for each output bin, spatially processing symbols corresponding to said output bin to develop spatially processed symbols, each output bin specifying one of a plurality of subchannels, wherein a spatial direction is defined for each of said plurality of subchannels.

226. (NEW) In a digital communication system, apparatus for preparing a sequence of symbols for transmission via a plurality of inputs of a channel:

a plurality of parallel subchannel inputs receiving said symbols, said parallel subchannel inputs corresponding to a plurality of subchannels, each subchannel corresponding to an input bin of a transmitter substantially orthogonalizing procedure and a spatial direction and a spatial direction associated with said input bin;

a spatial processor that, for each input bin, spatially processes symbols received by said subchannel input corresponding to said input bin, to develop a spatially processed symbol to